

OPERATIONS REPORT

"Falling Leaves"

TASK FORCE ABLE

9th Aerospace Defense Division

FPS-35

Montgomery Air Defense Sector

Thomasville, Alabama

**DEC** 1962

KENNETH W. GORDON  
Lt. Colonel, USAF  
Officer in Charge  
TASK FORCE ABLE  
9th Aerospace Defense Division

87 - AIR - 3412 LC

(140DC)  
90076.  
62.

Atch 2

This report will set forth the actions of Task Force Able, 9th Aerospace Defense Division at Thomasville, Alabama, for the period 28 October through 5 December 1962 in accordance with 9th Aerospace Defense Division Operations Plan 62-8, dated 30 October 1962.

Operations Plan 62-8 is titled, "Operations Plan for Cuban Missile Launch Surveillance and Detection," it has the unclassified nickname, "Falling Leaves."

MISSION

To provide a ballistic missile detection system capable of detecting missile launches from Cuba, and for integrating this system into the warning display provided to CINCNORAD, SAC, and USAF.

### TASKS

The Thomasville, Alabama, FPS-35 was directed to the task of ballistic missile detection coverage over Cuba:

Provide a 24 hour manual operation capable of ballistic missile surveillance over Cuba.

Provide surveillance of the air-breathing threat.

Take all necessary action to provide back-up surveillance to the Morestown, N. J., Tracker.

Take priority action to insure the earliest attainment of a ballistic missile detection capability against missiles launched from Cuba against the Continental United States and Southern Canada.

Improve the operational output of the Cuban Missile detection facilities.

#### CONCEPT OF OPERATIONS

The FPS-35 surveillance radar at Thomasville searches at 5 revolutions per minute, providing surveillance of the areas of prime interest between 129 to 169 degrees true, using the detection block from 486 to 729 nautical miles.

## ORGANIZATION

The 698th Radar Squadron (ADC), Thomasville, Alabama, is assigned to the 32nd Air Division, Montgomery Air Defense Sector. The Following Officers were assigned and on duty at the 698th Radar Squadron during the period covered by this report: Maj. Clarence L. Walters, Station Commander; Capt. William Fangohr, Administrative Officer; Lt. Reino R. Niemi, PSM Officer; Lt. Francie G. Haselbauer, C&E Officer; Lt. Joaquin Fox, Assistant C&E Officer; CWO Joseph R. Feagans, Communications Officer; CWO John L. Guifford, Civil Engineers Officer.

The total authorized personnel for Thomasville on 30 October 62 was 9 Officers, 143 Airmen, and 22 Civilians. Of that total, 7 Officers, 142 Airmen, 22 Civilians were assigned and present for duty.

The station has assigned 3 Philco Technicians, 5 Burroughs Technicians, and 7 Sperry Contractor Technical Services Personnel.

During "Falling Leaves" the augmentation to the station complement consisted of five (5) 1716's assigned on TDY by 9th Aerospace from ADC sources and 20 Airmen from units of the 32nd Air Division.

The five Officers from ADC units on temporary duty to the 9th Aerospace Defense Division with duty station Thomasville, consisted of Lt. Col. K. W. Gordon, Lt. Col. D. R. Smyth, Maj. J. N. Chorak, Maj. C. R. Jossy, and Maj. D. E. Wilson.

This group was assembled and briefed at Hq. 9th Aerospace Defense Division beginning at 0800 on 29 October. The briefing Officers were: Col. Frank E. Angiers, Deputy for Operations; Lt. Col. Leo J. Tighe, Chief of Training Division; and Capt. Kirby A. Nunn, ECM Officer of Hq. 9th Aerospace Defense Division.

The briefing included the intelligence summary concerning the Cuban situation and the requirements for a Radar Surveillance Net Consisting of three stations capable of detection and reporting of Cuban launched missiles. The briefing was a clear, concise, explanation of the mission.

The Officer Team departed Ent Air Force Base the same day (29 Oct) with a draft Operations Order and a letter of authority for the Officer-in-Charge. The team arrived at the 698th Radar Squadron, Thomasville, Alabama, and commenced operation in the net at 0100 of the 30th October.

The Station Commander was on hand when the team arrived. He reviewed the actions that had been taken prior to our arrival, advised us of the status of the equipment and personnel, and put the station and its facilities at the disposal of the Task Force for Project "Falling Leaves."

Task Force Able assumed operational control in the "Falling Leaves" network at 0100, 30 October.

Sixteen (16) Airmen (Radar Operations 27350's and 27370's), all that were assigned and present at the Thomasville Station at the time, were assigned to Surveillance Crews. The station personnel continued to work on a schedule of twelve hours on and twelve hours off until 2 November when 13 additional Airmen from units of the 32nd Air Division (SAGE) arrived and were used to augment the crews.

The augmentation personnel actually arrived on the evening of 1 November 62. Administrative matters, clearances, etc., were completed the same day. At 0900 hours on 2 November the new personnel were given a detailed briefing and cautioned as to its classified nature and were taken on a tour of the facility.

Lectures and demonstrations on the Plan Position Indicator and the Height Range Indicator were given. They were assigned a crew that included the experienced station personnel, thereby assuring continued team effectiveness under experienced supervision.

The first reorganized crew went on duty at 1600 hours, 2 November. All augmentation Airmen proved to be qualified radar operations technicians (27350 and 27370), quickly adapting to the established procedures and with the training provided during the first tour of duty were qualified as Combat Ready.

At 0900 hours on 31 October the regular station <sup>complement</sup> supplement of personnel was briefed on the mission that had been assigned to their station, with emphasis as to the sensitiveness and its classified nature. The mission orientation briefing "nipped rumors in the bud" and afforded the opportunity to fully justify the requirements for continued extraordinary effort on all personnel.

Specialized training of the Thomasville Radar Operations personnel was conducted by Duty SSO's and the crew chiefs. All of the Airmen proved to be qualified five or seven level Radar Operations Technicians. Training was required on the special procedures required by the mission.

Four crews were formed consisting of one (1) Officer Site Space Surveillance Officer and seven (7) airmen - 273X0. Each crew worked on an eight (8) hour per day schedule for a period of nine (9) days followed by a three (3) day break. This arrangement allowed for a full time SSSO and Crew Chief on each Crew with the manning of two (2) Plan Position Indicators (PPI's) in support of "Falling Leaves"

NOTE: In addition to the "Falling Leaves" operation the station personnel also operated two Height Range Indicator scopes on a twenty-four hour per day basis in support of the Montgomery Sector for the SAGE Mission.

and two (2) Height Sopes in support of the 32nd Air Division (SAGE).

A Task Force Able Office was established consisting of Lt. Col. Gordon and two NCO's.

During the exercise 15 additional Sperry Contract personnel visited the station in support of the reconfigured FPS-35 or to assure continued effectiveness of the equipment.

A Rome Maintenance Team consisting of 3 Technicians performed motor repair and installation of an additional drive motor in the Antenna Drive Assembly on 4 October. P200.

The following Vitro Personnel are assigned: Mr. W. M. Gray, Mr. G. E. Jones, Mr. D. F. Konicky, Mr. C. K. Thompson.

Mr. Bill Frank of RADC visited to coordinate contractual matters with the Sperry Corporation.

A special team, consisting of Mr. Lloyd Jones, Mr. Peter Julsart, Mr. Charles Aldino, performed an inspection of the bearing mounts in the antenna drive assembly to determine the course of and possible damage to the equipment, ~~as a result of noise~~ being detected in the bearing mounts.

9th Aerospace Division personnel visiting Thomasville in connection with the "Falling Leaves" operation were: Col. Robert W. Waltz, Commanding Officer; Col. Frank E. Angiers, Deputy for Operations; and Capt. Kirby A. Nunn, ECCMO, 9th Aerospace.

32nd Air Division and MOADS personnel visiting were: Lt. Col. E. D. Gillespie, Col. D. A. Clark, Director of Systems, ADC CCDSO L. G. Hanscom Field, visited for background information on the ~~expectiveness~~ effectiveness of the FPS-35 in its reconfigured mode.

Crew breakdowns with names of personnel assigned along with names of contractor personnel are attached.



OPERATIONS CREWS FOR OPERATION "FALLING LEAVES", TASK FORCE ABLE

OIC... Det #4 4608 Spt Sq Hanscom Fld Bedford Mass Col Kenneth W. Gordon  
NCOIC Operations.....TSgt James L. Thompson  
ASST NCOIC Operations.....SSgt William E. Bratcher

ALPHA CREW

Maj D. E. Wilson. 4627 Spt Sq Custer AFS Battle Creek Mich.....SSSO  
TSgt Charles J. Lewis, 678th AC&W Sq, Tyndall AFB, Florida, ..Shift Sup  
A1C James S. Bryce, 678th AC&W Sq, Tyndall AFB, Florida,.....Operator  
A1C John F. Williams, 678th AC&W Sq, Tyndall AFB, Florida.....Operator  
A2C Allan J. Brady, 678th AC&W Sq, Tyndall AFB, Florida.....Operator  
A2C Wm H. Moore Jr, 678th AC&W Sq, Tyndall AFB, Florida.....Operator  
A1C Hollis H. Walker, 698th Radar Sq, Thomasville Ala.....Operator  
A2C James Padgett, 698th Radar Sq, Thomasville Ala.....Operator

BRAVO CREW

Maj C. R. Jossey. 4628 Spt Sq McChord AFB Wash.....SSSO  
TSgt Fredrick L. Gilbo, 693rd Radar Sq, Dauphin Island AFS Ala..Shift Sup  
A1C Jeffers Liddle, 698th Radar Sq, Thomasville Ala.....Operator  
A1C Henry L. Stevens, 698th Radar Sq, Thomasville Ala.....Operator  
A2C David J. Brosnan, 861st AC&W Sq, Aiken AFS, C.....Operator  
A2C Max A. Nichols, 693rd Radar Sq, Dauphin Island AFS Ala....Operator  
A2C Donald K. Wolfe, 698th Radar Sq, Thomasville AFS Ala.....Operator  
A2C Charles C. Quimby, 693rd Radar Sq Dauphin Island AFS Ala..Operator

CHARLIE CREW

Maj J. N. Chorak.....Hq ADC Bnt AFB Colo.....SSSO  
TSgt Charles Hector, 698th Radar Sq Thomasville Ala.....Shift Sup  
A1C George R. Berrier, 861st Radar Sq Aiken AFS S. C.....Operator  
A1C Bobie G. House, 861st Radar Sq Aiken AFS S. C.....Operator  
A2C Palmer T. Higgins, 698th Radar Sq Thomasville Ala.....Operator  
A2C Robert L. Thornton, 698th Radar Sq Thomasville Ala.....Operator  
A2C Robert Gavan, 698th Radar Sq Thomasville Ala.....Operator  
A2C Douglas Rocks, 698th Radar Sq Thomasville Ala.....Operator

DELTA CREW

Lt Col Delbert R. Smyth.....Det #2 4608 Spt Sq Los Angeles Calif.....SSSO  
SSgt George H. Weddle, 698th Radar Sq Thomasville AFS Ala.....Shift Sup  
A1C Kenneth English, 702nd Radar Sq Hunter AFB Georgia.....Operator  
A1C Gilbert A. Filsinger, 698th Radar Sq Thomasville Ala.....Operator  
A1C Joseph L. Lusignan, 698th Radar Sq Thomasville Ala.....Operator  
A2C Haroland T. Cheek, 702nd Radar Sq Hunter AFB Georgia.....Operator  
A3C Mitchel W. Vickery, 698th Radar Sq Thomasville Ala.....Operator

SPERRY CONTRACTOR TECHNICAL SERVICES PERSONNEL ON SITE

TEMPLE, JAMES B.....SYSTEM  
HULBERT, EDWARD J.....ANTENNA & RETRO-FIT  
BISS, ROBERT J.....ECCM  
KUBA, FRANCIS E.....TRANSMITTER  
ROBINSON, FRANK M.....ECCM  
MARTINELLI, ROBERT D.....TRANSMITTER  
YOUNG, EUGENE A.....RECEIVER (TERMINATED 23 NOV 1962)

SPERRY Corporation personnel visits to the Thomasville Site in connection with "FALLING LEAVES" are as follows:

<u>NAME</u>	<u>FIELD OF INTEREST</u>
SMITH, WALTER.....	ENGINEERING SECTION HEAD
McMAHON, JAMES.....	RECEIVER (SYSTEM)
MEYROWITZ, PAUL.....	MAJAC
TALBOT, ARMAND.....	RECEIVER
BIGA, JOSEPH.....	RECEIVER
LANGE, DAVID.....	MAJAC
RICHARDSON, CHARLES.....	TRANSMITTER
GRANET, ARNOLD.....	TRANSMITTER
KRAUS, CHARLES.....	PARAMETRIC AMPS
COTIE, JOSEPH R.....	ANTENNA
SABINO, JOSEPH.....	RECEIVER (FIELD ENGINEER)
McCUE, JAMES J.....	FROM FIELD ENGINEER OFFICE
RINTAKAKI, KENNETH J.....	SYSTEM (FIELD TECHNICIAN)
COLANGELO, WILLIAM D.....	TRANSMITTER
MOORE, THOMAS.....	TRANSMITTER
MERCAVITCH, THOMAS.....	RECEIVER

PHILCO AUGMENTATION PERSONNEL

CONNORS, BOBBY C .....SITE ENGINEER  
WILSON, CHARLES H .....TECHNICIAN  
WILLIS, CHARLES M .....TECHNICIAN

BURROUGHS CORP..T-2

SAIMOND, DAVID A .....SITE ENGINEER  
ARNOLD, HAROLD .....TECHNICIAN  
WARE, ALFRED J .....TECHNICIAN  
DRAZEK, WILLIAM F .....TECHNICIAN  
ANDERSON, DAVID J .....TECHNICIAN

VITRO PERSONNEL

W. M. GRAY.....VITRO SUPERVISOR  
C. E. JONES.....TECHNICIAN  
D. F. KONICKY.....TECHNICIAN  
C. K. THOMPSON.....TECHNICIAN

### INTELLIGENCE

Intelligence messages received at the station were delivered immediately by the Communications Center to the Duty SSSO. The SSSO reviewed them for changes or important developments. If indicated, the Task Force OIC was notified.

Messages accumulated during the night were studied each morning by the Station Intelligence Officer, the Station Commander, and the OIC of Task Force "A".

SSSO's viewed the Intelligence file as a part of the action taken before assuming the duty position.

## FACILITIES

The following facilities at Thomasville were netted in to the system along with the equipment and facilities at Moorestown N. J. and Laredo Texas to provide for missile detection coverage.

The FPS-35 Radar was converted from its normal configuration to that of a configuration previously tested at Manassas Va and Benton Pa.

Station personnel and the Sperry Corporation were notified on Friday, 26 October, of the decision to modify and use the Thomasville FPS-35 for the "Falling Leaves" Operation.

The personnel of the Sperry Corporation with the assistance of station personnel made the conversion during the period 27-29 October.

The FPS-35 in its normal configuration has two complete systems with each system having a Transmitter, Receiver, and a Video Processing unit. Each combination is designated as a system giving the FPS-35 a System I and a System II. System II, however, was not operable for over 12 months (except for a few hours) due to a lack of parts initially and from further "Canabalizing" of its parts to keep System I in an operating condition.

The FPS-35 in its "Falling Leaves" mode employs high power transmitters programmed to change frequency on a pulse to pulse basis and a parametric amplifier feeding three (3) Constant False Alarm Rate (CFAR) Receivers.

These receivers are also programmed on a pulse to pulse basis to detect different frequencies during each transmit - receive period, thereby discriminating between 1st, 2nd, and 3rd "time around" targets.

The above arrangement provided detection at ranges from 2 NM to 721.1 NM in the increments of 2 NM - 235.7 NM; 249.7 - 478.4 NM and 487.4 NM - 721.1 NM respectively.

Four UPA-35 Indicators, two as primary and two as back-up with an operating position for the SSSO and his Crew Chief with a primary and back-up hot-line communications equipment in the operations building comprised the operations center for the "Falling Leaves" mission.

The location of the Thomasville FPS-35 is 31 degrees 56 minutes 16.868 seconds latitude, 87 degrees 45 minutes 8.34 seconds longitude.

## COMMUNICATIONS

The communications facilities at the 698th Radar Squadron prior to Operation "Falling Leaves" consisted of the following:

A SAGE MODE III BUIC Interim Switching System (PBX) consisting of 40 Tactical and 60 ON/LINE Stations. This system provides direct-dial telephone communications to all MOADS Sites and to the switchboard at the 32nd Air Division. Communications outside the 32nd Air Division were available through 32 Air Division switchboard or MOADS switchboard. This system is leased from and maintained by Southern Bell Telephone and Telegraph Company.

A Teletype System with MOADS and four (4) other sites consisting of one M-20 Teletype on-line with a M-19 Teletype on stand-by and an additional M-19 available for back-up.

Two (2) KL-7 off-line Crypto machines.

Facilities above were manned by nine (9) Air Force personnel on a twenty-four (24) hour a day basis, consisting of: 1 NCOIC, 2 Crypto Operators, 2 Maintenance Technicians, and 4 Teletype/Switchboard Operators.

At the outset of the operation "Falling Leaves," the following additional telephone facilities were made available:

A conferenced telephone hot-line loop with all units involved in the operation.

A hot-line to USAF Command Post.

These lines terminated at the SSO's position on the Surveillance dais. One Base On/Line station was already available at this position with an additional On/Line station available at each of the UPA-35 scopes in use. This telephone communications system was considered adequate for the operation of "Falling Leaves".

During the first few days of the "Falling Leaves" Operation, a considerable time lapse was experienced between time written and delivery time of messages (particularly classified messages) for Task Force "A". This was attributed to the following:

Increased high precedence traffic.

Off-line Crypto facilities requiring classified messages to be encrypted at MOADS and decrypted at Thomasville.

Inadequate message delivery procedures at Thomasville.

On 31 October 62, a direct on-line Crypto Facility to Ent AFB was suggested to Maj. Lister (9ADD) by Maj. Walters. Since on-line service was already available between Ent AFB and MOADS, it was determined that on-line facilities between MOADS and Thomasville would provide adequate service. An SSM-7 Crypto Facility was obtained and installed at Thomasville on 4 November 62 to provide this on-line capability. Simultaneously, to reduce the lag time between receipt and delivery of all messages locally, all SSSO's were authorized to receipt for and to release Task Force "A" messages direct from the 698th Communications Center. Local delays were thereby eliminated and, with the on-line Crypto Facilities operational, transmission time of messages was reduced in almost all cases by at least 2 hours. In some cases classified messages were received by the SSSO as soon as twenty (20) minutes after release from Ent AFB.



## MAINTENANCE

The FPS-35 operated during the "Falling Leaves" period for 880 hours, 28 minutes. Of the total operating hours the station was off for maintenance (scheduled and unscheduled) a total of 136 hours, 36 minutes for an operating percentage of ~~16.1~~ 84.22%.

It should be noted that one period of 19 hours and 53 minutes was required to accomplish a motor installation and motor repairs in the antenna drive group. This period was related to operations during "Falling Leaves". A second period of 11 hours, 28 minutes required for inspection of the antenna bearing not chargeable to "Falling Leaves".

The maintenance log for the period of "Falling Leaves" is attached.

Maintenance crews were organized to function on a 24 hour a day schedule under supervision of three (3) Officers. The key position in the maintenance effort is the Maintenance Control Center (MCC) located in the FPS-35 Tower.

Serious problems in maintenance existed at the beginning of the "Falling Leaves" period due primarily to the lack of spare parts for the FPS-35.

The military maintenance personnel as a unit is considered to be highly capable on the FPS-35.

Lack of accumulated experience factors to use as a basis for maintenance estimates contributed to lack of firm requests for down-time following break-downs.

Other factors contributing to maintenance problem include the existence in the system of parts known to be marginal but in use, again due to lack of parts and the "cascading" of failures during periods when the system is off the air.

Down-time was further extended due to the lack of an operational system II at the outset of the "Falling Leaves" period. When System II transmitter became operational the receivers used in the "Falling Leaves" mode were switched to System II transmitter. Further experience with the equipment later permitted the changeover to be made without physically moving equipment or rearranging the transmitter-receiver program.

Limited knowledge pertaining to the modifications to the Stalos, Frequency Programmer, and the added Parametric Amplifiers hampered efficient maintenance of the FPS-35 following the departure of the Sperry Installation Team. Neither the remaining Sperry Personnel or the military maintenance crews were sufficiently briefed to continue maintenance adjustments.

## **MAINTENANCE MANNING (FALLING LEAVES)**

Maintenance responsibility for the AN/FPS-35 is delegated to specialists in each of three sections. It was found that more efficient manpower management resulted when the personnel were required to specialize; thus becoming more quickly able to actually maintain the equipment to which they were assigned.

For project "Falling Leaves" this concept of specialization was expanded to provide a 24 hour repair capability. Sperry Corporation technicians sent to the station for the project were, to the extent possible, added to the experienced Air Force technicians already performing maintenance on the FPS-35. Problems relating to the modifications made for Falling Leaves were primarily the responsibility of the Sperry Corporation personnel.

The three sections of the FPS-35 are the Transmitter, Receivers, Video Processor (VP) and Monitor Anti-Jam and Control Console (MAJAC). The UPA-35's are maintained by the radar technicians assigned to the FPS-6 section. A Data Monitoring Control Center (DMCC) section is responsible for maintaining a continuous quality control check of the radar equipment and coordinating with MOADS MCS on the status of all SAGE subsystems such as the IFF, AN/FST-2 and Height Finders.

OIC - Major Clarence L Walters (In addition to Commander duties)

Ass't OIC - 1st Lt Joaquin Fox

Ass't OIC - 1st Lt Francis G Haselbauer

NCOIC Radar Maintenance - MSgt Gerald E Carlin

NCOIC FPS-35 - TSgt Peter A Woodard

NCOIC FPS-6 and PPI's - TSgt Richard Herro

### **TX**

SSgt Savage, Jack L

SSgt Scott, Quintin

\*SSgt Weaver, Jack R

ALC Haight, Rex A

ALC Samples, Kenneth

ALC Scott, William D

ALC Seals, John L

### **RX**

SSgt Jernigan, Henry H

SSgt Combs, Roy E

SSgt Tews, Alvin L

SSgt Coulter, Eugene M

ALC Gardiner, Maynard R

\*A2C Reed, Franklin D

\*A2C Crenshaw, John

A2C Hubka, Albert

### **VP & MAJAC**

SSgt Chapman, Robert E (VP)

SSgt Sharpless, Charles F (VP)

SSgt Quinn, Robert L (MAJAC)

ALC York, Richard L (MAJAC)

ALC Doss, Owen L (TDY) (VP)

\*A2C Foster, Linden A

\*A2C Striplin, Varnie

### **DMCC**

TSgt Hodge, Everette L

SSgt Christensen, Marvin E

ALC Webb, John E (TDY)

ALC LeBlanc, Nelson O (TDY)

ALC Rogers, Paul R (TDY)

### **FPS-6 & I's**

TSgt Herro, Richard

\*TSgt Brogdon, Otis L

SSgt Sutton, Thomas

\*SSgt Reale, Rocco A

\*SSgt Crain, James E

ALC McKinney, Lawrence

\*ALC Heiden, William H

\*ALC Lang, Kenneth A (TDY)

\*A2C Lane, William M

From the notification that the set was to be used for "Falling Leaves" an all-out effort by all the maintenance people yielded coverage by a minimum of two fully qualified technicians in every section on every shift. Several times during major breakdowns all of the people assigned to the section were working. No crew schedule was adopted until 5 Nov. The maintenance remained on an as needed basis with the best qualified people performing the maintenance. Different number of people assigned to the different sections necessitates a schedule which can only be described on a crew basis per section.

\* - These technicians are only 3 levels.

# EQUIPMENT STATUS RECORD

<u>RADAR</u>	<u>OPERATING HOUR</u>	<u>TIME OUT</u>	<u>DATE</u>	<u>TIME IN</u>	<u>TOTAL DOWN TIME</u>	<u>PERCENT OFF AIR</u>	<u>REASON FOR OUTAGE</u>
System #2	840:07	0607	4Dec	0613	:06		Stalo adjust power supply
"	841:15	0715	"	0735	:20		Stalo adjust power supply
"	843:51	0951	"	0954	:03		Overload in 35KV power supply
"	846:46	1246	"	1249	:03		Overload in 35KV power supply
"	850:11	1611	"	1612	:01		Tx overheat kicked out
"	851:50	1750	"	1900	1:10		PM approved by EB for MDS
"	855:20	2120	"	2122	:02	15.5%	Check MAJAC
"	859:01	0101	5Dec	0104	:03		Overload in 35KV power supply
"	873:56	1556	"	1601	:05		Coolant failure in Amplitron
"	876:00	1800	"	2028	2:28		PM (scheduled)
"	878:00	2031	"	2040	:09		Insulation in 35KV-high voltage power supply burned out
"	878:42	2042	"	2152	1:10	15.48	" "
"	880:28	2228	"	2341	1:13	16.4%	Floating deck in 35KV power supply

THIS STATION CLOSED AT 0001Z 6 December 1962.

# EQUIPMENT STATUS RECORD

<u>RADAR</u>	<u>OPERATING HOUR</u>	<u>TIME OUT</u>	<u>DATE</u>	<u>TIME IN</u>	<u>TOTAL DOWN TIME</u>	<u>PERCENT OFF AIR</u>	<u>REASON FOR OUTAGE</u>
System #2	755:08 <del>xxxxxxx</del>	1708	30Nov	1712	:04		Sensitivity check
"	758:00	2000	"	2006	:06		" "
"	758:20	2020	"	2023	:03		" "
"	758:28	2028	"	2058	:30	16.5%	PM (MDS) EB approved
"	765:14	0314	1Dec	0323	:09		Change parametric amps
"	766:52	0452	"	0500	:08		Sensitivity check
"	777:00	1500	"	1600	1:00		Corrective maint approved by EB on transmitter trouble
"	778:15	1615	"	1715	1:00	16.4%	Corrective maint approved by EB
"	794:38	0838	2Dec	0935	:57		Tx out, pulse lost on drive to amplitron
"	803:00	1700	"	1744	:44	16.3%	PM (scheduled)
"	815:14	0514	3Dec	0518	:04		Overload in 35KV power supply
"	827:36	1736	"	1739	:03		Overload in rx
"	828:00	1800	"	1915	1:15		1 hr PM 15 min extension granted for MDS
"	829:50	1950	"	1955	:05		5 min corrective PM app by EB
"	832:07	2207	"	2224	:17	15.9%	Rx Stalo trouble
"	835:24	0124	4Dec	0144	:20		Stalo trouble
"	838:02	0402	"	0411	:09		

# EQUIPMENT STATUS RECORD

<u>ADAR</u>	<u>OPERATING HOUR</u>	<u>TIME OUT</u>	<u>DATE</u>	<u>TIME IN</u>	<u>TOTAL DOWN TIME</u>	<u>PERCENT OFF AIR</u>	<u>REASON FOR OUTAGE</u>
System #1	680:04	1404	27Nov	1408	:04		Tx overheat kic ked off
"	680:39	1439	"	1441	:02		" "
"	680:44	1444	"	1450	:06		" "
"	682:42	1642	" 28/0410		11:28	18.6%	ANTENNA BEARING CHECK, Tune rx /crystal bank. Had trbl geting tx back up and took MDS
"	703:53	1353	28Nov	1407y	:14		Tx overheat and kicked off
"	707:00	1700	"	1752	:52		PM (scheduled)
"	712:24	2224	"	2254	:30	17%	Tx overheat and kicked off
"	716:50	0250	29Nov	0350	1:00		Tx overheat and kicked off
"	720:11	0611	"	0616	:X05		Searge in power tx off
"	729:06	1506	"	1509	:03		Overheat relay
System #2	730:05	1605	"	1756	1:51	16.8%	1 hr PM extended 1 hr to change from System #1 to System #2 due to System #1 5th stage output tank burned
"	742:37	04387	30Nov	0500	:23		Lost Trigger (Video processor motor generator kicked off)
"	744:13	0613	"	0641	:28		Unsteady trigger
"	752:08	1408	"	1412	:04		Unscheduled maintenance - power supply has restricted oil flow
"	752:27	1427	"	1627	2:00		Power supply overheating clogged filter

# EQUIPMENT STATUS RECORD

<u>RADAR</u>	<u>OPERATING HOUR</u>	<u>TIME OUT</u>	<u>DATE</u>	<u>TIME IN</u>	<u>TOTAL DOWN TIME</u>	<u>PERCENT OFF AIR</u>	<u>REASON FOR OUTAGE</u>
System #1	563:59	1759	22Nov	1803	:04		Power overload tripped circuit break shut off transmitter
"	564:26	1826	"	1841	:15		Circuit breaker caused overload in amplifier
"	564:48	1848	"	2021	1:33		PM (extended 30 mins tune rx)
"	568:45	2245	"	2249	:04		3 hr corrective maintenance - Break- down broke down EB recalled Card Cal
"	569:00	2300	"	23/0201	3:01	16.6%	3 hr corrective PM
"	572:35	0235	23Nov	0350	1:15		Corrective PM on 5KV Power supply - 20 min extension granted by EB
"	589:31	1931	"	1940	:09	16.3%	Screen on tetrode door came open transmitter out
"	597:23	0323	24Nov	1048	7:25		Emergency PM to replace rotorstator gas barrier and align tetrodes
"	609:30	1530	"	1625	:55	17.1%	PM (scheduled)
"	624:52	0652	25Nov	0712	:20		Tx overheating
"	629:50	1150	"	1153	:03		Tx overheating
"	630:22	1222	"	1230	:08		Tx overheating
"	634:00	1600	"	1635	:35	166%	PM (scheduled)
"	650:08	0808	26Nov	0818	:10		Tx overheat
"	660:13	1813	"	1815	:02	16%	Amplitron kicked off
"	678:09	1209	27Nov	1358	1:49		Trigger trouble

# EQUIPMENT STATUS RECORD

<u>RADAR</u>	<u>OPERATING HOUR</u>	<u>TIME OUT</u>	<u>DATE</u>	<u>TIME IN</u>	<u>TOTAL DOWN TIME</u>	<u>PERCENT OFF AIR</u>	<u>REASON FOR OUTAGE</u>
System #2	363:30	0930	14Nov	0943	:13		Rx overdriven on parametric amps
"	368:01	1401	"	1500	:59	16.4%	PM (scheduled)
"	381:27	0327	15Nov	0354	:27		Overload in 24 volt system
"	393:00	1500	"	1657	1:57	15.9%	PM 1 hr extension approved by EB to take MDS
"	420:00	1800	"	17/1353	19:53		PM (scheduled for antenna modification) to install one antenna drive motor and turn slip rings on three more
"	440:56	1456	"	1506	:10	18.7%	protection circuit (set kicked off)
			18 Nov	no outages			
			19 Nov	no outages			
"	51550	1750	20Nov	1806	:16		Photo cell burned out and caused tetrodes kick off
"	51715	1915	"	1925	:10	17%	Synchronizer circuit breaker kicked off
"	529:40	0740	21Nov	0809	:29		Change from System #2 to System #1
System #1	533:54	1154	"	1226	:32		Overheated amplatron
System #2	542:00	2000	"	2211	2:14	16.3%	PM (extended 1 hr to tune amps)
"	547:23	0123	22Nov	0201	:38		Transmitter burned out on System #2 changed to System #1
System #1	563:44	1744	"	1750	:06		Power overload tripped circuit breaker shut off transmitter

# EQUIPMENT STATUS RECORD

<u>ADAR</u>	<u>OPERATING</u> <u>HOUR</u>	<u>TIME</u> <u>OUT</u>	<u>DATE</u>	<u>TIME</u> <u>IN</u>	<u>TOTAL</u> <u>DOWN</u> <u>TIME</u>	<u>PERCENT</u> <u>OFF</u> <u>AIR</u>	<u>REASON FOR OUTAGE</u>
System #2	272:46	1446	10Nov	1546	1:00	-	Maintenance on rx's and performance checks
"	275:29	1720	"	1723	:03		Performance check
"	278:30	2030	"	2130	1:00	18.6%	PM (scheduled)
"	285:48	0348	11 Nov	0400	:12		Circuit breaker overload
"	287:10	0510	"	0541	:31		Emergency maintenance to re-align integrators
"	291:16	0916	"	1005	:49		Set kicked off due to high voltage and filament
"	298:00	1600	"	1715	1:15		PM extended 15 mins to change thiatron in amplitrion circuit
"	303:53	2153	"	2155	:02		Video integrator adjustment
"	304:18	2218	"	2220	:02	18%	Tx out 35KV power supply
"	319:35	1335	12Nov	1435	1:00		Change thiatron in System #2
"	320:56	1456	"	1500	:04		Integrator oscillating
"	322:48	1648	/"	1656	:08	17.4%	Coolant failure in amplitrion (cooling flow too low)
"	345:30	1530	13Nov	1955	4:25		PM with extensions approved by EB to 2000 due to Parametric amplifier oscillating
"	351:58	2158	"	2209	:11	16.8%	Switch parametric amplifiers



# EQUIPMENT STATUS RECORD

DAR	OPERATING HOUR	TIME OUT	DATE	TIME IN	TOTAL DOWN TIME	PERCENT OFF AIR	REASON FOR OUTAGE
System #1	163:05	0105	6Nov	0107	:02		Amplitron kicked out of radiate
"	165:22	0322	"	0330	:08		Amplitron overloading
"	179:46	1746	"	1827	:41	12.8%	Change cartridge in tetrode cooling system
"	188:30	0230	7Nov	0312	:42		Sensitivity check
"	192:40	0640	"	0704	:24		Water resistance low in tetrodes
"	198:35	1235	"	8/0233	13:58	17.9%	Transformer out in transmitter Rotorstator or 5th stage
"	217:45	0745	8Nov	0845	1:00		MDS test
"	224:31	1431	"	1630	1:59		1 hr PM extended 1 hr to video processors and integrator adjustments and cable check out
"	228:01	1801	"	2106	3:05		Programming
"	232:30	2230	"	2300	:30	14.9%	MDS test
System #2	247:33	1333	9Nov	1436	/1:03		Trigger trouble
"	253:00	1900	"	2100	2:00	18.7%	1 hr PM extended 1 hr to tune Parametric rx's and adjust antenna drive
"	259:30	0130	10Nov	0225	:55		PM to change parametric amps and MDS syncrodine trouble
"	262:15	0415	"	0430	:15		Integrator Oscillator trouble
"	268:45	1045		1145	1:00		Emergency PM to bring up rx sensitivity and check out parametric amps

# EQUIPMENT STATUS RECORD

<u>RADAR</u>	<u>OPERATING HOUR</u>	<u>TIME OUT</u>	<u>DATE</u>	<u>TIME IN</u>	<u>TOTAL DOWN TIME</u>	<u>PERCENT OFF AIR</u>	<u>REASON FOR OUTAGE</u>
System #1	9:39	1539	30Oct	1558	:19		Overload in 35KV power supply
"	10:16	1616	"	1804	1:48		KV floating deck blown fuse
"	12:05	1805	"	1807	:02		" "
"	15:17	2117	"	2121	:04		Tx overheat kicked out
"	15:24	2124	"	2134	:10		Unscheduled on Tx
"	16:35	2235	"	2245	:10	14.9%	Sensitivity check
"	19:28	0128	31Oct	0245	1:17		Tx overheat kicked out
"	2059	0259	"	0333	:34		Tx overheat kicked out
"	22:25	0425	"	0435	:10		Sensitivity check
"	3001	1201	"	1214	:13		Sensitivity check
"	34:00	1600	"	1601	:51	16.3%	Sensitivity check
"	56:28	1428	1Nov	2300	8:32	22.2%	KV power supply
"	82:00	1600	2Nov	1700	1:00		PM
"	87:45	2145	"	2152	:07	17.7%	Tx overheat kicked out
XXXXXXXXXXXXXXXXXXXXXXXXXXXX			3 Nov	no outages			
"	131:45	1745	4Nov	1817	:32	12.1%	PM
"	155:53	1753	5Nov	6/0007	6:14	13.9%	Rotorstator on 5th stage broken

## SUPPLY

Prior to Operation "Falling Leaves," the supply support being rendered was limited primarily to System I. The FPS-35 System II was not compatible for SAGE usage or testing. Therefore, the parts from System II were utilized to keep System I operational.

Replacement parts for System II were requested on priority 2 or 5 depending upon estimated due dates of other items required for System II.

Priorities were requisitioned from Electronic Support Branch (ESB), MOAMA for stock number items and ROAMA focal point for non-listed items until 25 October 1962.

Normal stock replenishment requests were not submitted after 14 October 62 due to transfer of Supply support from Brookley to the Electronic Accounting Control Center (EACC) at Tyndall AFB, which began 1 November 62.

Many stock items supplied under installation contract AF 30(635)-9544 were on hand as AFTO 88's have not been signed.

Actions taken for Operation "Falling Leaves" included the following:

The 698th Squadron Unit Supply was closed and the three (3) airmen were assigned to Material Control, for duty.

The AF Form 84B's were screened and a list of fast moving items in short supply were telephoned to Brookley AFB after coordination with material control at MOADS. Most items were on order through the ESB MOAMA but had not been received.

The Montgomery Air Defense Sector (MOADS), Material was contacted for assistance in procuring priority and back-up items, on priority basis.

The 698th Maintenance Section was contacted as to requirements and all priority items required to bring System II into operational status were requested to be upgraded. This was telephoned to Material Control at MOADS.

The priorities and support included:

MOADS notified Brookley, 26 October 62, to give this site priority action.

MOADS notified site on 27 October 62 that Project "ADC 425" assigned to this site.

Ops Plan 62-8 received on 31 October 62 setting forth priority code name and project number.

Overall support was considered very good. Of 16 priority items upgraded or ordered from 26 October 62 through 29 October 62, all but one

had been received before or on 1 November 62. Average pipeline time was 3 1/2 days. The ESB MCAMA and Material Control MOADS provided excellent support on the short supply items.

Some of the problems encountered were:

Lack of supply status in that there is no way to locate items requisitioned or to determine requisition action until the material is actually received at the squadron.

Confusion as to times items were due at Mobile, thereby necessitating more than one vehicle run to obtain the items.

## COMMENTS

Results obtained on the detection of objects in orbit through the coverage of the station plus the tracking of objects launched from Cape Canaveral during the period of "Falling Leaves" support the decision to use the FPS-35 in the Falling Leaves" Operation for the detection of missiles that could have been launched from Cuba.

It is considered that any missiles launched toward the United States from the Cuban area under surveillance would have been detected upon their entry into the radar beam approximately 40 - 50 miles above the launch site.

Radar coverage was estimated at the 660 NM range mark to be from 50 NM in altitude to 180 NM in altitude over the surface for a target with reflective characteristics equal to or greater than 10 square meters.

Direction of flight within the radar beam was limited to an increasing or decreasing range and would appear the same on the PPI scopes whether the target was rising from the ground or penetrating the atmosphere from space to the ground. In other words, an object entering the top of the radar beam will appear on the PPI exactly the same as one entering the bottom of the beam if the speed of the objects were the same. Some difference in speed could be expected between rising and falling objects; however, data to determine whether the difference would be detectable on a UPA-35 scope was not obtained.

From the estimated beam patterns provided by the Sperry Corporation it is estimated that missiles with a range of 1100 NM launched from the vicinity of Havana would have provided a track of six (6) "blips" for a 2.5 square meter target; nine (9) "blips" for a 10 square meter target or fourteen (14) "blips" for a 100 square meter target. These figures assume an initial "blip" at the lower limit of the beam and a target speed of 5000 NM per hour. These estimates are maximum figures.

UPA-35 PPI scopes, although capable of use for this type of operation, are subject to substantial distortion, particularly as the object being detected approaches toward the station. Several plotting aides were experimented with to attempt refinement of the range and azimuth readings of detections. Results obtained were considered to be unsatisfactory and would have been unacceptable for operational use. Future operations of this type should include appropriate display devices that would minimize distortion in range or azimuth.

Look angle bulletins provided to the station appeared to be inadequate for the purpose intended. Continuous study of the reason for the failure to correlate a reasonable percentage of detected objects lead to the discovery that the basis for computing the look angles was in error by 1000 feet in latitude and 5 miles in longitude NM. This error could have contributed substantially to the failure to correlate expected orbiting objects. Corrected look angles were received for the day following termination of "Falling Leaves."

It should be noted further that due to the antenna rotation rate coupled with the width of the radar beam and the speed of any orbiting object that the likelihood of multiple "blips" on scheduled objects is minimal except on those objects traveling on an orbit directly over the station. In one instance of this kind of track, eight (8) "blips" were observed. The object was identified as "Echo." Photos were obtained and are attached. The size of the "blips" do not appear to be significantly different from other sightings from apparently smaller objects.

The telling sequence scope reader to SSSO at the station permitted updating a track or initiation of a new track by each scope reader each 12 seconds. Telling sequence SSO to CC&DF was measured to be a minimum average of 23 seconds. Total station capacity in the network based upon the above was two (2) minutes. If required, an increased capacity would have been obtained by increasing the number of SSOs on duty to two (2) and utilizing the back-up circuit that was available.

The brilliancy of "blips" appearing on the UPS-35 scopes was such that possible confusion between "blips" and normal noise was extremely unlikely. Untrained personnel had no difficulty in distinguishing the detected objects even though detections usually were limited to a single "blip."

Facilities at Thomasville, Alabama, were considered to be adequate for the assigned mission. Difficulties encountered in maintenance and supply were considered to be the limiting factors. Priorities encountered in maintenance and supply were considered to be the limiting factors. Priorities established for supply of parts were used successfully during the mission. A breakdown would be experienced as the parts available in Depot, at the manufacturer or at other stations, were depleted. Some parts unique to the modification were not available from any source.

Personnel provided for the operation both at the station, the augmentation airmen and officers, was excellent. Augmentation airmen quickly adapted to the mission and all proved to be fully qualified. Some personal hardship would have been experienced by the airmen if the period of the "Falling Leaves" mission would have continued. It is considered advisable for future missions of this type that the initial emergency period be defined for purposes of personnel assignment. Personnel for extended TDY should then be selected to continue the mission beyond the "emergency" period. Providing officers of field grade rank proved justifiable and proper. The maturity and background knowledge of the officers was extremely valuable. There were no major personnel problems.

On 27 October two Engineers along with on-site personnel moved two Parametric Amplifiers (one for a spare only) to the fifth floor of the radar tower, connected and tuned one up, and then tied it into the system. One Engineer along with one Sperry Universal Technical Services Company (UTEC) man on site went to the Monitoring Anti Jamming and Control (MAJAC) Console and performed modifications there that would enable the three receivers to be programmed at different frequencies, each radar period, to give a capability of viewing not only 1st time around targets but also 2nd and 3rd time around targets. One of the Sperry Engineers along with on site Maintenance personnel sent to the two system receivers and made modifications to these. On-site power supplies were used to power-up the third receiver that the Sperry people brought along.

The video processor contains two Integrators which are utilized in the present arrangement.

All of the above modifications and additional installations were completed in approximately 15 hours after the Sperry Engineers arrived on site. However, we were not ready to go into operations as a System until 10:00 PM, 29 October due to the failure of the floating deck in the transmitter tetrodes.

In the event, in the future, it becomes desirable to convert an AN/FPS-35 Radar into a Long Range System it is recommended that the on-site personnel be alerted to exactly what equipment will be utilized, so they can start checking and peaking each unit. If this is done and provided a transmitter is in good shape it is possible that a FPS-35 Radar can be converted to Long Range Operation in approximately 5 to 7 hours after the Engineers arrive on location.

JAMES B. TEMPLE  
Sperry Site Director  
Thomasville, Alabama

## SUMMARY OF CONVERSION ACTIONS ON THE AN/FPS-35

We at the AN/FPS-35 Radar Location in Thomasville, Alabama were notified of RADC's decision to set this site up for use in Operation "Falling Leaves" on Friday, 26 October 1962, by a telephone from Mr Walter Smith at the Sperry Plant in Great Neck, New York, to Mr Chester Warner, Sperry Site Director at the Thomasville location. Mr Warner in turn alerted the Sperry Contract Technical Services personnel and Air Force personnel of this action to take place and instructions were given to peak our Constant False Alarm rate (CFAR) receiver channel and re-tune the transmitter flat across it's band.

On Saturday, 27 October 1962 at 10:00 AM, a group of four Engineers from the Sperry Plant and all the equipment needed to convert this radar arrived at this site. These Engineers along with the on-site Maintenance personnel accomplished this task.

The following is a brief description of the configuration and the operating conditions of the radar when the Engineers arrived on site. This radar is designed to be redundant in that there are two separate transmitters, receiver and video processing groups. For the past year System #1 was our prime system, mainly because it contained the latest experimental video processing gear. This processing gear is in the form of "Class G" chassis and the design and final testomg was being done to finalize a configuration that would be integrated into SAGE. Special attention was given in design and testing for netting a system that would give an extremely low false alarm rate to the SAGE Direction Center even under heavy jamming conditions. Some of the techniques employed to accomplish this are frequency agility, pulse compression, pulse coding, DICKIE FIX, CFAR, MTI, staggered repetition rate, high transmitted energy output, and digital quantizers that automatically threshold to any change in signal noise level to insure a constant false alarm rate to the AN/FST-2 Computer in the form of digital information. Category #3 testing on this radar configuration was almost complete by 26 October 1962.

The System #2 Radar has not been operational (except for a few hours) in over a year due to parts outage and a number of parts were removed from System #2 Transmitter to support System #1.

The System #2 Radar was the same as System #1 as described, except it did not contain the "Class C" or latest receiver fixes to enable us to do the automatic quantizing in the AN/FPS-35.

The present radar configuration for "Falling Leaves" does not employ as many of the above techniques. The only ones now employed is DICKIE FIX CFAR, high transmitted power output and frequency agility, however, we do have a Parametric Amplifier in the receiver front end that gives a extremely low noise figure, which results in the receiver being able to take a comparatively small energy return pulse and process it.

We are still redundant with the transmitter system but we are not with the receiver. In fact we employed both systems receivers plus an additional receiver channel that was brought along on 27 October which is now being used in the arrangement. Thus, in order to extend our range for this operation three receivers are employed. Each receiver being programmed at a different frequency during each radar period.